

## THE ARNOLD ARBORETUM DURING THE FISCAL YEAR ENDED JUNE 30, 1935

THE WINTER of 1934–1935 was nearly as severe as that of the previous year.<sup>1</sup> Very little snow fell up to December 31, but a heavy fall of snow took place on January 23 and much of it remained all winter. In January temperatures varied, but low temperatures prevailed. This persistent cold, after the previous severe winter, caused considerable damage to trees and shrubs in the Arboretum. Some of this damage was not apparent until early summer. In the fall of 1934 several temperature stations were established in various parts of the Arboretum which recorded variations of as much as 12 degrees between different stations. Temperature records from these stations will be of much assistance in selecting favorable localities for new plantings.

Early in the spring, an extensive spraying program was carried through to combat a bad infestation of canker-worm. This was successful and prevented defoliation. Other successful spraying programs were carried out for leaf miner in hawthorns and for various other insect pests.

To facilitate the best growth in several groups of shrubs, it was necessary to move and rearrange a large number of plants. More of this work is to be carried out this fall; many large specimens which were badly damaged by winter conditions will have to be replaced.

The extensive collection of lilac varieties flowered exceedingly well last spring and attracted thousands of visitors, also the crab apples and later the mountain laurels flowered profusely, while most of the cherries and particularly the Japanese cherries showed the effects of the two preceding severe winters, as did many of the azaleas and rhododendrons.

During the year 1258 packages of seed were sent out, 782 in the United States, 476 to 12 foreign countries, also 2187 plants and 545 varieties of scions and cuttings. There were received from the United States and other countries 454 packages of seed, 1894 plants, and 592 cuttings and scions. Five hundred and ninety-five plants were added to the Arboretum collections. — L. V. S.

**Pathological Laboratory.**—The laboratory of plant pathology has now completed the first seven years of its existence. It was established through the efforts of the Supervisor, Professor Oakes Ames, in fulfill-

<sup>1</sup>Records of the effects of the low temperatures during the winter of 1933–34 on the trees and shrubs in the Arnold Arboretum have been published in the Arnold Arboretum Bulletin of Popular Information (Ser. 4, Vol. II, nos. 7 and 8).

ment of the expressed wish of the late Director, Charles Sprague Sargent, and as part of Dr. Sargent's conception of the Arboretum as an institution for the study of woody plants in all fundamental aspects. Professor Ames wisely housed the laboratory in quarters that facilitate cooperative effort and interchange of ideas with the Arboretum's propagator, superintendent and geneticist. The functions of the laboratory were defined as comprising interest in the Arboretum's living collections, extension services, instruction and research.

Naturally collections so extensive, so varied and of such diverse origins and requirements as are those of the Arboretum constantly present health problems of concern to the superintendent and much material of interest to the pathologist. Likewise from time to time pathological problems call for consultation or cooperative undertaking between the pathologist and the propagator or the geneticist. It should also be stated that control measures evolved in the laboratory are tested or applied in the Arboretum whenever possible.

The Arboretum has always exercised a generous attitude with respect to extension services; its plant stores and its knowledge are freely open to all. As might be expected many inquiries are referred to the laboratory of plant pathology and the number has increased yearly. They come from private individuals, nurserymen, arborists, city and town tree wardens, foresters, landscape architects, etc. An account in some detail of this phase of the laboratory's activities formed a part of the report for 1933-4.

Constituted as a unit of an educational institution, the Arboretum has felt that it should bear some instructional responsibility. So from the first the laboratory of plant pathology has assumed its share. A course in the pathology of the forest and of woody plants open to qualified undergraduates and graduates has been offered in Harvard University and from two to six appropriate research students each year have been directed in their special investigations. The Biological Laboratories and the Bussey Institution have provided suitable laboratory space for this work. Of the ability and the research accomplishments of these students I can speak highly. Five of them received travelling fellowships, including three Sheldon awards, at the conclusion of their undertakings at the Arboretum; and seven of them are now filling responsible positions in pathology, mostly research, here or abroad. While this participation in instruction has taken considerable time, most of it has been in connection with research and one result has been the enriching of the research activities of the Arboretum. This is of significance because research is the foremost function of the laboratory of plant pathology.

Statements covering the research accomplished by the laboratory during its first seven years have been included in the preceding annual reports. It will suffice here to report for the past year and merely to add that in the seven year period many problems have received attention and that many of these have been fruitfully solved.

For the year 1934-5 the laboratory reports progress with or completion of studies on the following topics: coniferous rusts, Gymnosporangium diseases, mycotrophy in *Pinus* and wilt diseases of elms. With respect to coniferous rusts particular mention should be made of the elucidation of life history connections, involving firs and spruces, in the genera *Chrysomyxa* and *Milesia*, and the working out of features of taxonomic value based on the morphology of spermogonia. The investigations of I. H. Crowell and J. D. MacLachlan on Gymnosporangium diseases, begun four years ago, are finished. From the results obtained lists have been compiled showing the immunity or grade of susceptibility of hundreds of pomaceous and Juniperus species to the more important species of *Gymnosporangium* found in eastern North America. Moreover, a new means of practical control has been demonstrated that obviates the necessity of eradication of either host, the only method practised up to this time. As a by-product of the research, about two thousand packets of culture materials have been added to the Arboretum's herbarium—a unique contribution. Dr. MacLachlan will spend the year 1935-6 on a Sheldon fellowship in Jamaica, B. W. I., working in a cooperative undertaking between the Arboretum and the Jamaican government on a devastating new rust disease of *Pimenta*, a genus of the economically important family Myrtaceae. This calls to mind the fact that so far no work has been done by our laboratory of plant pathology at the Arboretum's tropical branch in Cuba—almost certainly a fertile field. One of the most valuable results of the year's program has been the demonstration of the role of mycorrhizae in *Pinus* as collectors of certain of the tree's mineral requirements; thus an answer of far-reaching significance is afforded to long unanswered questions as to whether they are important and, if so, in what way.

The fate of America's elms, threatened as they are by the Dutch elm disease, is now the most important tree problem on this side of the Atlantic. The Arboretum's program in the campaign against the Dutch elm disease, as outlined in the report of 1933-4, has been continued vigorously. Distinct progress has also been made in our biological and control studies on a native wilt disease of elms the symptoms of which are almost the same as those of the Dutch elm disease. (See article by D. B. Creager in this number of the Journal of the Arnold Arboretum.)

An essential part of this work was done at our field laboratory on Long Island. That laboratory should be maintained for at least one more summer. Towards the end of 1934, when there was an alarming amount of wavering and pessimism over the possibility of successfully combatting the Dutch elm disease in America, the Arboretum took a strong public stand in support of the policy of complete eradication. It is gratifying to know that federal and state efforts towards eradication during 1935 afford justification for our optimism. With more reason than ever, we again express the belief that our elms can be saved if public support be maintained. — J. H. F.

**Cytogenetic Laboratory.**—The work on cytotaxonomic problems during the past year includes an analysis of *Robinia* by Dr. Whitaker, a cytological analysis of *Verbena* by Dr. Dermen, and a cytotaxonomic study of *Tradescantia* with the cooperation of Dr. Anderson.

A comparison of chromosome structure and behavior in mitosis and meiosis seems to explain the mechanism of meiosis. Other work on chromosome structure has been continued, especially the spiral structure of the chromonemata in meiotic chromosomes in *Tradescantia* and *Vicia*. The mechanism of development and differentiation has been studied in relation to environmental factors.

The breeding work has been continued with lilacs, roses, magnolias and azaleas. A plant breeding nursery has been established in which there are about a hundred first generation hybrids. A few of these hybrids flowered this year for the first time. — K. S.

**The Herbarium.**—During the past fiscal year, 16896 specimens have been added to the herbarium bringing the total number up to 408699 specimens.

Of these accessions about 3900 came from the United States and Canada, 4600 from Central and South America inclusive of Mexico, 1150 from Europe and western Asia, 2350 from China, 390 from Formosa, 1150 from India and Malaysia, 1800 from Australasia, and 530 were cultivated plants.

Among the more important collections received during the year may be mentioned: about 8000 specimens representing 1100 numbers from Mexico collected by C. H. and M. T. Mueller, 1350 numbers with many duplicates from Guatemala collected by A. F. Skutch, 290 specimens from Ecuador collected by H. J. F. Schimpff, 293 specimens from Peru collected by G. Klug, 1157 specimens from Brazil collected by A. B. Krukoff, 3100 specimens from Kwangtung and 701 specimens from Hainan received from Lingnan University, 2660 plants from western

China collected by J. F. Rock, 705 specimens from Hupeh collected by H. C. Chow and received from Wu-han University, 1296 specimens from Borneo collected by J. and M. S. Clemens, 1476 specimens from Sumatra collected by Rahmat Si Torroes, 215 specimens from Hawaii and 124 specimens from Samoa received from the Bishop Museum in Honolulu; 140 specimens from South Africa collected by Ecklon and Zeyher.

To the fruit collection, 395 specimens were added, bringing the total number up to 8379.

Additions to the wood collections consisted of 155 numbers, bringing the total up to 3786.

The collection of negatives of types and critical specimens, chiefly Chinese, amounts now to 3012 negatives, 268 having been added during the year.

For study outside of the Arboretum herbarium, 847 specimens were sent out on loan to 14 institutions and individuals in this country and in Europe.

The distribution of duplicates amounted to 19059 specimens sent to 44 institutions in the United States, Canada, Europe, Asia, Australasia and Africa.

Botanical exploration by members of the staff and by expeditions wholly or partly financed by the Arnold Arboretum, has been carried on in America, eastern Asia and Africa. During the summer of 1934, Dr. H. M. Raup continued the study of the flora of the Harvard forest and its neighborhood started the year before, and collected herbarium material. Mr. C. H. Mueller and Mrs. Mary T. Mueller returned in August, 1934, from their collecting tour to Mexico referred to already in last year's report. They collected chiefly in the Sierra Madre Oriental, Department of Nuevo Leon, and brought back about 8000 specimens, representing 1100 numbers. The collection is being identified chiefly at this institution and the Gray Herbarium, and already a number of new species has been described from this collection. About the middle of June, 1935, Mr. Mueller started on another collecting tour to the same locality. Mr. A. F. Skutch collected from July, 1934 to January, 1935, for the Arnold Arboretum in southwestern Guatemala in the Departments of Huehuetenango, Quezaltenango and Quiché; he collected about 1350 numbers with many duplicates, also wood specimens. His collection is being determined chiefly at the Gray Herbarium and the Arnold Arboretum.

In China, two institutions received financial support from the Arnold Arboretum in 1934 for carrying on botanical exploration. The Fan

Memorial Institute of Biology under the direction of Professor H. H. Hu sent an expedition to Yunnan to collect chiefly near the border of Cochinchina, and another to Szechuan which penetrated into the interior Lololand not yet visited by any botanical collector. From Lingnan University expeditions have been sent under the direction of Dr. Franklin P. Metcalf to the provinces of Kwangsi and southern Kiangsi.

Mr. M. Dinklage who had made before important collections in tropical west Africa for the Berlin Botanical Museum, went to Liberia in 1934 to collect in the hinterland of Monrovia for the Arnold Arboretum. As the rainy season prevented his starting soon after his arrival for the Nimba mountains, his final goal, he collected first in the neighborhood of Monrovia and toward the end of the year he started for the Nimba mountains which, however, he was destined not to reach. He was taken sick on the way and died of dysentery on February 2, at the Ganta Mission Station. — A. R.

**The Library.**—At the end of June 1935 the Library comprised 42,025 bound volumes, 10,917 pamphlets, and 17,573 photographs, a gain of 579 volumes, 432 pamphlets and 332 photographs. Many pamphlets and a few books have been received as gifts, including "Arbejder fra den Botaniske Have i København," Russian works, and miscellaneous articles. Important articles from periodicals and other works have been analyzed, and notice of all available obituaries of botanists have been filed in the author catalogue.

There has been an increase over last year in the number of photographs received, the largest accessions comprising those taken by Dr. Edgar Anderson during his trip to the Balkans, Mr. E. J. Palmer's taken on collecting trips in the western and southwestern United States, Prof. J. G. Jack's taken in Japan and Mrs. Susan D. McKelvey's in Jamaica.

The use of the collection has been extensive. Many photographs have been sold, including 700 taken by the late Dr. E. H. Wilson on his expedition to eastern Asia, 1917-18, purchased by Jardin Botanique de l'État, Bruxelles. Sixty-three lantern slides have been added, the majority of them being colored.

Cards filed during the year include 1,766 in the card catalogue of books in the Library, 336 in the catalogue of photographs, 4,617 in the "Card-index of New Genera, Species, and Varieties Published by the Gray Herbarium," and 5,625 in the manuscript "Index of Illustrations and of New Genera, Species and Varieties of Ligneous Plants Published Since 1915," prepared at the Arboretum, bringing the total of the latter to 106,675. For supplements to the author and subject "Catalogue of the Library" 2,589 slips have been filed. The subject slips now ready for publication number approximately 20,000.

Volumes bound number 229 and more than 100 smaller books and pamphlets were put into pamphlet binders. Clipping files and scrap-books preserve much interesting material.

Approximately 225 visitors registered in the Library during the year. These include Ynes Mexia, University of California, Berkeley; Rev. and Dr. M. H. Rioch, India; J. J. Wilder, Honolulu; E. Percy Phillips, National Herbarium, Pretoria; Jan T. Byhouwer, Velsen, Holland; Chi-yian Chiao, University of Nanking; E. Lowell Kammerer, Morton Arboretum, Lisle, Illinois; Alfred Gundersen, Brooklyn Botanic Garden; Clara W. Fritz, Ottawa; Z. H. Hellwig, Warsaw; H. B. Haddow, Toronto; G. Weidman Groff, Lingnan University, Canton, China; T. Yamamoto, Taihoku Imperial University, Formosa; David D. Keck, Carnegie Institution Laboratory, Stanford University, California; G. E. Gates, Judson College, Rangoon, Burma; A. S. Thurston, University of Maryland, College Park; E. D. Merrill, New York Botanical Garden; Donald Wyman, Cornell University, Ithaca, N. Y.; Isabella Preston, Ottawa, and librarians attending the Convention of the Special Libraries Association held in Boston early in June. Dr. L. M. Ames of the U. S. Bureau of entomology and plant quarantine has spent more than a year studying *Berberis* and *Mahonia*.

The publications of the Arboretum, the "Journal of the Arnold Arboretum" and the "Arnold Arboretum Bulletin of Popular Information" were issued regularly. "Contributions from the Arnold Arboretum of Harvard University," numbers vii and viii, and "Through the Arnold Arboretum" were published during the year. Of approximately 487 periodicals and reports currently received from all parts of the world, 220 are received in exchange for our "Journal" and "Bulletin" and 10 in exchange for our "Contributions." The subscription to 20 periodicals was cancelled with a saving of about seventy dollars. Reprints from the "Journal" were also sent out as a medium of exchange.

The following new periodicals have been received, a large number in exchange for our publications, some by gift and some by purchase. They are as follows:

- ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA. Proceedings.  
Vol. lxxxii → 1930 → Philadelphia. 1931 →
- ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA. Year book.  
1930 → Philadelphia. 1931 →
- AUSTRALIA — *Council for scientific and industrial research*. Journal.  
Vol. viii, no. 1 → Melbourne. 1935 →
- BLACK ROCK FOREST. Papers. Vol. i, no. 1 → April 1935 → Cornwall-on-the-Hudson. 1935 →

- BLUMEA. Vol. i, no. 1 → August 25, 1934 → Leiden. 1934 →  
 BOTANICAL review, interpreting botanical progress. Vol. i, no. 1 →  
 January 1935 → Lancaster, Pa. 1935 →  
 CHRONICA botanica. Vol. i → Leiden. 1935 →  
 INSTITUT J. B. CARNOY, *Louvain*. Travaux biologiques. No. 1 →  
 January 11, 1929 → Lierre; Louvain. 1929 →  
 INSTITUTUL DE CERCETĂRI ȘI EXPERIMENTAȚIE FORESTIERĂ. Analele.  
 Ser. 1. Anul i, nr. 1 → București. 1934 →  
 JAPAN — *Imperial forestry experiment station*. Bulletin. No. 31 →  
 November 1931 → Tokyo. 1931 →  
 JOURNAL of South African botany. Vol. i, pt. 1 → January 1935 →  
 Kirstenbosch. 1935 →  
 LEXINGTON BOTANIC GARDEN. Lexington leaflets. Vol. i, no. 1 →  
 April 11, 1931 → Lexington, Mass. 1931 →  
 LISBON — *Instituto botânico de faculdade de ciências*. Trabalhos.  
 i. 1925–32. Lisbôa. 1932?  
 NAŠ vrt; revija hortikulturnog društva. God. i, svezak 1–4, 7 →  
 Zagreb. 1934 →  
 NEW ZEALAND journal of science and technology. Vol. xi, no. 5 →  
 Wellington. 1930 →  
 PLANT science literature. Vol. i, no. 1 → Dec. 31, 1934 — Jan. 5,  
 1935 → Washington. 1935 →  
 REGENSBURG, *Germany* — *Königlich-baierische botanische gesell-*  
*schaft*. Schriften. Bd. i. Regensburg. 1792.  
 REVISTA sudamericana de botanica. Vol. i, no. 1 → February 1934 →  
 Montevideo. 1934 →  
 ROCZNIKA nauk ogrodniczych. (Annales des sciences horticoles.)  
 Tom. i → Warszawa. 1934 →  
 ROSENJAHRBUCH. (Verein Deutscher rosenfreunde.) Berlin.  
 1934 →  
 SOVETSKIE subtropiki. No. 1–2. July–August 1929 → Sukhum.  
 1929 →  
 THARANDT — *Forstliche hochschule* — *Institut für ausländische und*  
*koloniale forstwirtschaft*. Mitteilungen. Nr. 1 → Dresden;  
 Tharandt. 1932 →  
 ZEITSCHRIFT für weltforstwirtschaft. Bd. i, heft. 1 → Okt. 1933 →  
 Neudamm; Berlin. 1933 →

Among other important accessions are:

- AMERICAN GEOGRAPHICAL SOCIETY. New England's prospect. New  
 York. 1933.



- AUGUSTIN, Samuel. Prolegomena in systema sexuale botanicorum. Viennae. 1777.
- BRITISH MUSEUM, *London*. A catalogue of the works of Linnæus, and publications more immediately relating thereto, preserved in the libraries of the British museum, Bloomsbury, and the British museum, Natural history, South Kensington. 2d ed. London. 1933.
- BRITISH MUSEUM, *London* — *Natural history*. Catalogue of the books, manuscripts, maps and drawings in the museum. Vol. vii. Supplement J–O. London. 1933.
- BUSSEY, Benjamin. Will of Benjamin Bussey (with four “codicils,” 1835–41).
- DEGENER, Otto. Flora hawaiiensis. [Book i. Honolulu. 1932.]
- DIOSCORIDES, Pedanios. The Greek herbal of Dioscorides. Illustrated by a Byzantine, 512. Englished by John Goodyer, 1655. Edited and first printed, 1933, by R. T. Gunther. Oxford. 1934.
- DOMIN, Karel. The beech forests of Czechoslovakia. Bern; Berlin. 1932.
- FESTSCHRIFT Cornelius Osten. Montevideo. 1933.
- GOEBEL, Karl. Organographie der pflanzen insbesondere der arche-goniaten und samenpflanzen. 3<sup>e</sup>, umgearbeitete aufl. Teil i-iii. Jena. 1928–33. — Ergänzungsband. [i, ii.] Jena. 1924–31.
- INTERNATIONAL BOTANICAL CONGRESS, 5th, *Cambridge*, 1930. International rules of botanical nomenclature adopted by the International botanical congresses of Vienna, 1905, Brussels, 1910. Revised by the International botanical congress of Cambridge, 1930. Compiled by the Editorial committee for nomenclature from the Report of the subsection of nomenclature prepared by John Briquet. 3<sup>e</sup> ausgabe. Jena. 1935.
- LE CONTE, John B. Observations on the genera Viola, Utricularia and Gratiola. A reprint from the *Annals of the Lyceum of New York* (1824–1826), to which are appended photographs of the hitherto unpublished plates of the author, destined to illustrate these works. Edited by J. A. Nieuwland. Notre Dame. 1917.
- MARIE-VICTORIN, frère. Flore laurentienne. Montréal. 1935.
- PARSONS & SONS, co. Descriptive catalogue of hardy ornamental, flowering shrubs and vines; including rhododendrons, roses, magnolias, Chinese and Ghent azaleas, camellias, Japanese maples and other rare and choice plants [in Kissena nurseries]. Flushing, L. I., [1887?]
- RAFINESQUE, Constantine Samuel. Monographie des coquilles bivalves et fluviatiles de la rivière Ohio contenant douze genres et

soixante-huit espèces. [Avec] Remarques sur les rapports naturels des genres *Viscum*, *Samolus* et *Viburnum*. Bruxelles. [1820.]  
 SOWERBY, Arthur de Carle. The naturalist in Manchuria. 5 vol. Tientsin. 1922-30.

Books were sent out as inter-library loans to Field Museum of Natural History, Library of the United States Department of Agriculture, Smithsonian Institution, McGill University, United Fruit Company, Massachusetts State College, Wellesley College, University of Pennsylvania, Dartmouth College, New York Horticultural Society, Massachusetts Institute of Technology, Tufts College Library, Boston Society of Natural History, Massachusetts Horticultural Society and Michigan State College, as well as to many departments of Harvard University.

In addition to loans, photostats or typewritten copies of references have frequently been made when books could not be loaned.

Books were borrowed for the use of the members of the staff and students from the Boston Public Library, Massachusetts Horticultural Society, Library of the United States Department of Agriculture and from the University libraries.

A list of the forestry periodicals and reports prepared by the United States Forest Service was checked for our holdings, and additional material was prepared for inclusion in a supplement to "Index Londinensis."

At the invitation of the Committee on Binding Advertisements in Periodicals the Library has agreed to cooperate with some thirty-four other libraries to bind 12 of its periodicals entire, all advertisements included.

In the early spring Miss Margaret Hayes, under the direction of Mr. J. F. Ballard of the Boston Medical Library, spent more than two months in the Library indexing books and periodicals for a union list of the more important works to be found in special libraries in Boston.

The Librarian attended the Convention of the American Library Association in Denver from June 24-29, where she visited the public and university libraries. — E. M. T.

### **Bibliography of the published writings of the staff and students July 1, 1934—June 30, 1935**

AMES, Oakes.

An addition to the genus *Vanilla*. (In *Harvard university, Botanical museum leaflets*, 1934, ii, 101-103.)

A contribution to our knowledge of the orchids of Spanish Honduras. Pt. ii. (In *Harvard university, Botanical museum leaflets*, 1934, iii, 17-36.)